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**SURF ZONE MINE CLEARANCE AND ASSAULT SYSTEM**

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT (1) THOMAS J. GIESEKE and (2) KYRILL V. KOROLENKO, citizens of the United States of America, employees of the United States Government, and residents of (1) Newport, County of Newport, State of Rhode Island and (2) Portsmouth, County of Newport, State of Rhode Island, have invented certain new and useful improvements entitled as set forth above of which the following is a specification.

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3 **SURF ZONE MINE CLEARANCE AND ASSAULT SYSTEM**  
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5 **STATEMENT OF GOVERNMENT INTEREST**

6 The invention described herein may be manufactured and used  
7 by or for the Government of the United States of America for  
8 Governmental purposes without the payment of any royalties  
9 thereon or therefor.  
10

11 **BACKGROUND OF THE INVENTION**

12 **(1) Field of the Invention**

13 The present invention relates to a system attachable to a  
14 vehicle for clearing mines and other obstacles.

15 **(2) Description of the Prior Art**

16 Some military operations require a system to clear mines  
17 and obstacles in shallow waters, a surf zone, and a craft  
18 landing zone. In addition, a requirement exists for mine  
19 hunting and clearance in deep waters (over 40 feet in depth).

20 A number of mine clearing systems are known in the prior  
21 art. These include the systems disclosed in Turner (U.S. Patent  
22 No. 5,448,936); Jarman (U.S. Patent No. 4,903,246); and Posseme  
23 et al. (U.S. Patent No. 5,844,159). These systems and other

1 available mine clearing systems have not fully met the needs of  
2 the military services.

3 Also known in the prior art are systems for protecting  
4 marine vessels from torpedo attack. One such system is  
5 disclosed in Wallin (U.S. Patent No. 6,305,263). Still further,  
6 systems have been developed for protecting vessels against  
7 covert swimmers. One such system is disclosed in Burt (U.S.  
8 Patent No. 5,267,220).

9 A replacement for existing mine clearing systems, which  
10 will operate in very shallow waters through the beach zone, is  
11 optimally maneuverable from the ship to the objective. In  
12 addition, the replacement for existing mine clearing systems  
13 optimally will not place personnel in the line of fire, will not  
14 require carrier battle group support, will not require  
15 allocation of lift capabilities, and will operate from over-the-  
16 horizon.

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## 18 SUMMARY OF THE INVENTION

19 Accordingly, it is a general purpose and primary object of  
20 the present invention to provide a system attachable to a  
21 vehicle which adequately clears mines in a surf-zone and varying  
22 water-depth.

23 To attain the object described, there is provided a system  
24 attachable to a vehicle for clearing mines and other unwanted

1 obstacles. The system is attachable to a vehicle which operates  
2 in the surf zone of a beach as well as in deeper waters with the  
3 system including means for detecting mines and other obstacles,  
4 and means for destroying the mines and the other obstacles.

5 In a preferred embodiment, the detecting means comprises a  
6 sonar targeting system mounted within a pod which can be focused  
7 in multiple directions and the destroying means comprises an  
8 underwater gun system also mounted within a pod which can target  
9 in multiple directions. The underwater gun system preferably  
10 fires underwater munitions to destroy the mines and/or other  
11 obstacles.

12 Other details of the surf zone mine clearance and assault  
13 system of the present invention, as well as other objects and  
14 advantages attendant thereto, are set forth in the following  
15 detailed description and the accompanying drawings wherein like  
16 reference numerals refer to like elements. It will be  
17 understood that the particular devices embodying the invention  
18 are shown by way of illustration only and not as limitations of  
19 the invention. The principles and features of the present  
20 invention may be employed in various and numerous embodiments  
21 without departing from the scope of the invention.

1                   **BRIEF DESCRIPTION OF THE DRAWINGS**

2           A more complete understanding of the invention and many of  
3   the attendant advantages thereto will be readily appreciated as  
4   the same becomes better understood by reference to the following  
5   detailed description when considered in conjunction with the  
6   accompanying drawings wherein:

7           FIG. 1 illustrates a system for clearing mines and  
8   obstacles in accordance with the present invention; and

9           FIG. 2 is a schematic of the operation of the underwater  
10   gun of the system of the present invention.

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12                   **DESCRIPTION OF THE PREFERRED EMBODIMENT(S)**

13          Referring now to FIG. 1, the system 10 of the present  
14   invention generally comprises a vehicle 11 supporting a medium-  
15   caliber submersible gun 12 capable of firing supercavitating  
16   undersea munitions (not shown) with the gun targeting by the use  
17   of an advanced active sonar system 14. The vehicle 11 may be a  
18   landing craft such as an LCU (landing craft utility), a remotely  
19   piloted, underwater, unmanned vehicle (UUV), a submersible  
20   AAAV(advanced amphibious assault vehicle) or any other known  
21   vehicle suitable for the operation of the gun 12 and the sonar  
22   system 14.

23          The complete system 10 includes the latest advancements in  
24   mine-hunting sonar, underwater gun technologies, supercavitating

1 underwater munitions, and amphibious/undersea capabilities to  
2 create a weapon capable of destroying underwater mines and other  
3 obstacles from waters of varying depths and to further include  
4 the surf-zone.

5       If the sonar targeting system 14 fails to function  
6 adequately, the system 10 includes other options to destroy  
7 mines and other obstacles such as optical sighting for targeting  
8 and saturation of a target area with projectiles where no  
9 targeting system is otherwise effective. Once ashore, the  
10 system 10 can support other landing operation functions such as  
11 beach mine clearance, obstacle removal, and light fire support.

12       In FIG. 1, the vehicle 11 is illustrated as a landing craft  
13 utility (LCU), which is a standard vehicle used in beach assault  
14 operations. The gun 12 of the vehicle 11 includes one or more  
15 barrels 16 depending on the requirements for targeting  
16 underwater munitions. The gun 12 is properly sealed to function  
17 underwater and, if required, includes sabot stripping and muzzle  
18 gas management systems. The pod 18, for mounting the gun 12,  
19 includes suitable means known in the art for allowing the pod 18  
20 to be moved in multiple targeting directions.

21       The gun 12 is directed by readings taken from the  
22 underwater sonar targeting system 14 when activated. The sonar  
23 targeting system 14 is of the type of any suitable sonar  
24 targeting system known in the art and is mounted in a pod 20

1 which is similar to the pod 18 and movable in multiple targeting  
2 directions. During a clearing operation, the locations of mines  
3 detected by the sonar targeting system 14 are fed to an onboard  
4 targeting computer 22 (see FIG. 2) with the targeting computer  
5 22 used to properly direct the gun 12.

6 The vehicle 11 can be provided with an underwater  
7 stabilization system 24. The underwater stabilization system 24  
8 comprises a two-component positioning system known in the art.  
9 The underwater stabilization system 24 allows the gun 12 and the  
10 sonar targeting system 14 to point in multiple targeting  
11 directions despite undulations of the vehicle 11.

12 Both the sonar targeting system 14 and the underwater gun  
13 12 are supported by one or more deployment arms 26. The  
14 deployment arms 26 allow the pods 18 and 20 to be rigidly held  
15 in the water. The deployment arms 26 are preferably large and  
16 rigid enough to prevent relative motion of the gun and sonar  
17 pods 18 and 20. If desired, the arms 26 can be fully retracted  
18 into the vehicle 11 to enable rapid transit and vehicle stowage.  
19 Any suitable means known in the art may be used to allow the  
20 arms 26 to move from a first position where the pods 18 and 20  
21 are deployed to the fully retracted position.

22 The deployment arms 26 may be joined to at least one large  
23 structure 28 on the assault vehicle platform deck. Contained  
24 within the structure(s) 28 is powering equipment for the gun 12

1 and the deployment arms 26, as well as, a magazine 30 (see FIG.  
2 2) for the gun 12. A feed system 32 is provided to carry  
3 munitions from the magazine 30, through the deployment arms 26  
4 to the gun 12 in the pod 18. Each structure 28 can be rigidly  
5 mounted to the vehicle 11 or mounted to a wheeled vehicle (not  
6 shown) that can be deployed from the vehicle 11 to the beach.

7 In operation, the structure 28 of the system 10 is placed  
8 aboard the vehicle 11. The vehicle 11 then transits from the  
9 beach assault staging area to the mine field. The deployment  
10 arms 26 lower the pod 18 and the pod 20 into the water over the  
11 sides of the vehicle 11. The sonar targeting system 14 in the  
12 pod 20 scans using acoustic energy, the area in front of the  
13 vehicle 11 for underwater mines and other unwanted obstacles.  
14 When a mine or other target is detected, the pod 18 with the gun  
15 12 is pointed at the mine or target and a burst of mine piercing  
16 underwater projectiles is fired from the gun. The kinetic and  
17 explosive energy in the projectiles causes a mine or other  
18 target to explode. This is repeated as the vehicle 11 advances  
19 toward the beach.

20 In areas where the sonar targeting system 14 in the pod 20  
21 cannot target mines, such as an area with breaking waves, a  
22 saturation technique is implemented, sending enough projectiles  
23 into the area from the gun 12 to significantly ensure that any  
24 mines or unwanted targets in the area would be impacted. Once



1 at or near the beach, the pod 18 with the gun 12 and the pod 20  
2 with the sonar targeting system 14 is moved from a deployed  
3 underwater position to a retracted position where the pod 18 and  
4 the pod 20 are located above the waterline such that the gun 12  
5 is used to fire at on-shore targets. If the system 10 is  
6 attached to a wheeled vehicle, the vehicle can be driven onto  
7 the beach where it can continue to saturate areas where mines  
8 and other undesirable obstacles might be found.

9 The system 10 of the present invention produces rapid  
10 clearance of surf-zone mines. An advantage of the system 10 is  
11 that the system is much more rapid than existing surf-zone mine  
12 clearance systems and that it has multiple utilities (can be  
13 used for land strike once ashore).

14 The deployment arms 26 are either hard mounted to the  
15 vehicle 11 or attached to a wheeled vehicle that rolls on and  
16 rolls off the vehicle 11.

17 If required by an anticipated operation, the pods 18, 20  
18 can be mounted to a single deployment arm 26.

19 If required by an anticipated military operation, the pods  
20 18, 20 may be mounted to a dedicated surface or snorkeling  
21 vehicle such as an advanced amphibious assault vehicle or power  
22 boat.

23 It is apparent that there is provided in accordance with  
24 the present invention a surf zone mine clearance assault vehicle

1   which fully satisfies the objects, means, and advantages set  
2   forth hereinbefore. While the present invention has been  
3   described in the context of specific embodiments thereof, other  
4   alternatives, modifications, and variations will become apparent  
5   to those skilled in the art having read the foregoing  
6   description. Accordingly, it is intended to embrace those  
7   alternatives, modifications, and variations as fall within the  
8   broad scope of the appended claims.